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**(54) Hydraulic piston-cylinder unit**

(57) An improved hydraulic piston-cylinder unit, characterised by consisting of a parallelepiped body (2) containing a cylindrical chamber (4) obtained by milling, said chamber housing a piston (6) formed in one piece, its piston rod (14) emerging through a plug (42) formed

by lathe turning and engaged at a threaded circumferential portion (44) thereof with a corresponding threaded portion (40) provided on the circumferential surface of the chamber (4), a four-way two-position solenoid valve (22) being in contact with the parallelepiped body.

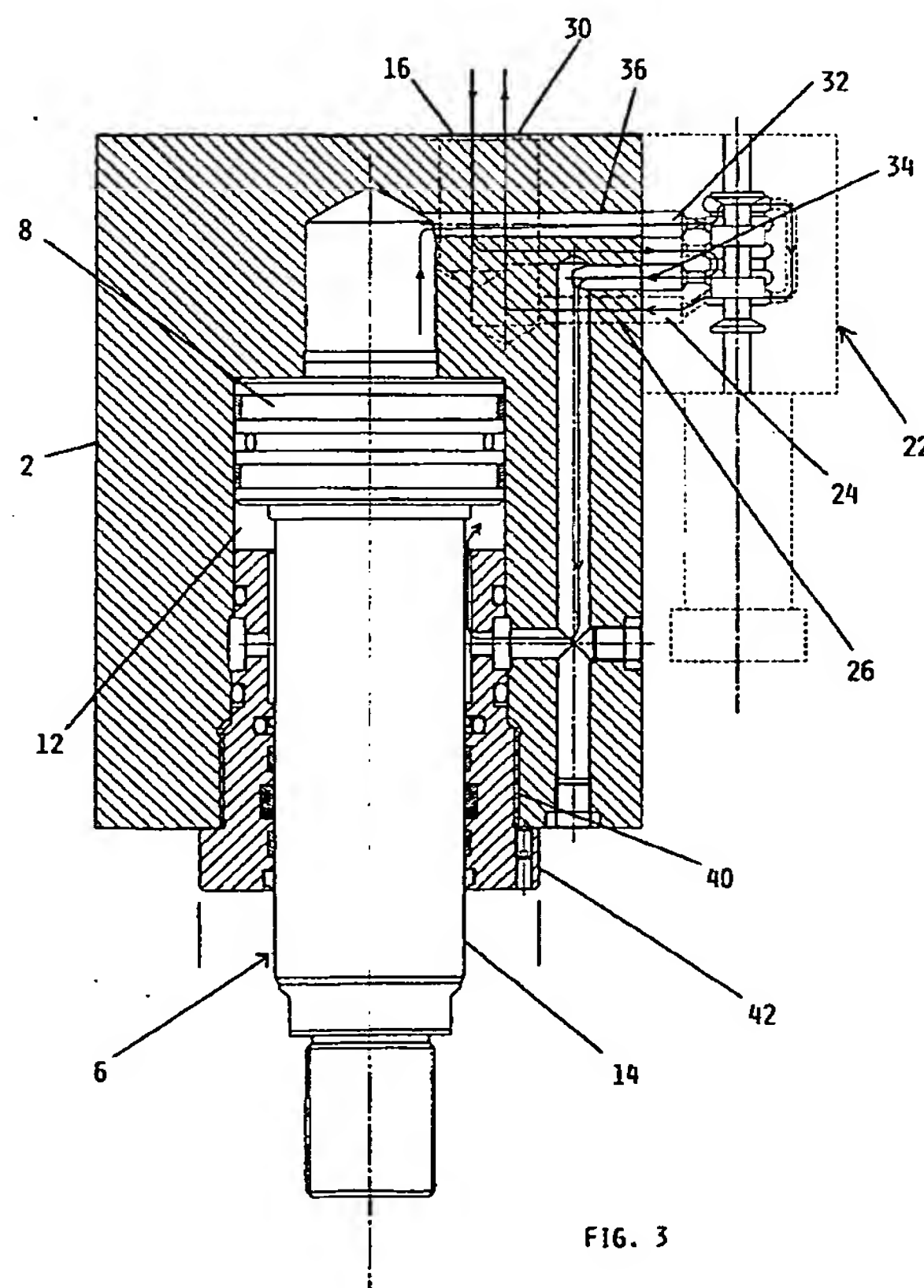


FIG. 3

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## Description

[0001] This invention relates to an improved hydraulic piston-cylinder unit.

[0002] Double-acting hydraulic piston-cylinder units are known in which the oil is fed alternately upstream and downstream of the cylinder by a solenoid valve interposed between the hydraulic control unit and the piston-cylinder unit.

[0003] These piston-cylinder units generally incorporate a body in which a substantially cylindrical chamber is provided housing the piston, which emerges via its piston rod at one end of said chamber. The chamber is closed at the other end by a closure plug.

[0004] The piston is generally divided into two parts, namely the piston rod and the head, the shape of this latter generally resulting in eccentricity between the axis of the head guides and the piston rod sliding axis. This two-component shape also has the further drawback of a body subjected to different mechanical and thermal stresses.

[0005] A further drawback of these piston-cylinder units consists of a substantial difficulty in forming the seats housing the gaskets and guides for the piston rod as these seats have to be milled on account of the parallelepiped shape of the body.

[0006] Another drawback consists of the fact that as the valve is not in contact with the body of the cylinder, the piston stroke is insufficient to enable the oil contained in the connection pipes to be replaced with "fresh" oil originating from the control unit.

[0007] According to the invention these drawbacks are eliminated by an improved hydraulic piston-cylinder unit characterised by consisting of a parallelepiped body containing a cylindrical chamber obtained by milling, said chamber housing a piston formed in one piece, its piston rod emerging through a plug formed by lathe turning and engaged at a threaded circumferential portion thereof with a corresponding threaded portion provided on the circumferential surface of the chamber, a four-way two-position solenoid valve being in contact with the parallelepiped body.

[0008] The invention is further clarified hereinafter with reference to the accompanying drawings, in which:

Figure 1 is a side view of a hydraulic piston-cylinder unit according to the invention,

Figure 2 is a plan view thereof,

Figures 3 and 4 are a longitudinal section showing the piston-cylinder unit in the two configurations of the piston head.

[0009] As can be seen from the figures, the hydraulic piston-cylinder unit of the invention comprises substantially a parallelepiped body 2 in which a seat 4 is provided for housing a piston 6, the head of which defines two chambers 10, 12 respectively.

[0010] Specifically, the chamber 10, hereinafter called

the upstream or upper chamber, is the chamber which does not contain the piston rod 14 whereas the chamber 12, hereinafter called the downstream or lower chamber, is the chamber which contains the piston rod 14.

[0011] In the body 2 there is provided a threaded aperture 16 for inserting the pressurized oil delivery pipe, this aperture communicating with a conduit 18 connected to an inlet hole 20 of a four-way two-position solenoid valve 22 applied against the hydraulic piston-cylinder unit.

[0012] The solenoid valve 22 also presents an outlet hole 24 connected to a conduit 26 provided within the body and communicating with a threaded aperture 30 through which oil discharges to the control unit.

[0013] The solenoid valve also presents two outlets/inlets 32, 34 communicating respectively with two conduits 36, 38 provided within the body, the conduit 36 feeding the upstream chamber 10 of the cylinder and the conduit 38 feeding the downstream chamber 12 of the cylinder.

[0014] The hydraulic piston-cylinder unit is formed in three parts, namely:

- the parallelepiped body 2 within which the cylindrical seat 4 is formed in two portions of different diameter by milling, that portion facing outwards comprising a circumferential thread 40,
- the actual piston 6 comprising the piston rod 14 and head 8, these being formed in one piece by lathe turning,
- for closing the cylindrical seat 4 and for guiding the piston rod 14, a plug 42 also obtained by lathe turning and presenting an externally threaded greater-diameter portion 44 for coupling to the threaded portion 40 of the cylindrical seat.

[0015] In the outer and inner surface of said plug there are provided a plurality of circumferential seats 46 for housing the seal members.

[0016] The hydraulic piston-cylinder unit is assembled in the following manner:

the head 8 of the piston 6 is firstly inserted into the seat 4, after which the plug 42 is screwed in and is maintained in its closed position by the engagement of a set-screw 48 in a corresponding seat 50 provided in the outer surface of the body 2.

[0017] The operation of the piston-cylinder unit is traditional in that for one position of the solenoid valve (see Figure 3) the oil enters through the aperture 16, passes through the conduit 18, enters the solenoid valve through the hole 20, leaves through the conduit 34, enters the conduit 38 and feeds the downstream chamber 13 containing the piston rod.

[0018] At the same time the oil contained in the chamber 10 enters the conduit 36, passes through the aperture 32 of the solenoid valve which discharges it through

the hole 24 to the conduit 26, and then through the aperture 30 connected to the control unit.

[0019] In the other position of the solenoid valve (see Figure 4) the conduit 20 is connected to the conduit 36 and the conduit 38 is connected to the conduit 26 so that oil flows into that chamber 10 not containing the piston rod. 5

[0020] From the foregoing it is apparent that the hydraulic piston-cylinder unit of the invention presents numerous advantages, including: 10

- considerable compactness,
- low cost in that two of the pieces and the relative machining are obtained by lathe turning,
- the oil contained in the connection conduits to the solenoid valve can be regenerated. 15

### Claims

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1. An improved hydraulic piston-cylinder unit, **characterised by** consisting of a parallelepiped body (2) containing a cylindrical chamber (4) obtained by milling, said chamber housing a piston (6) formed in one piece, its piston rod (14) emerging through a plug (42) formed by lathe turning and engaged at a threaded circumferential portion (44) thereof with a corresponding threaded portion (40) provided on the circumferential surface of the chamber (4), a four-way two-position solenoid valve (22) being in contact with the parallelepiped body. 25 30
  2. A hydraulic piston-cylinder unit as claimed in claim 1, **characterised in that** the plug (42) is formed from two portions of different diameter. 35

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